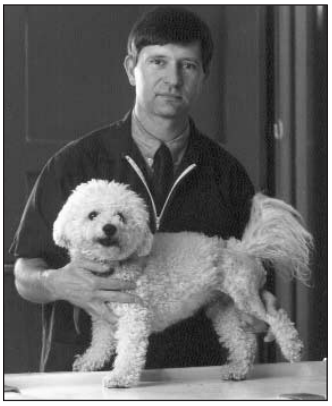

Common long bone fracture in small animal practice — Part 2

Greg Harasen

Part 1 of this series outlined a survey of 282 long bone fractures treated by the author between September 1983 and December 2002. Nearly 80% of these fractures could be categorized as 1 of 5 fracture types. This "hit parade" of most common long bone fractures is being presented along with principles of surgical management and prognosis.

In Part 1, the 5th most common long bone fracture, fracture of the distal epiphysis of the humerus, and the 4th most common, fracture of the distal epiphysis of the femur, were discussed. Part 2 continues the countdown.

3. Distal radius/ulna fractures

Fourteen percent (39/282) of our long bone fractures involved the distal 1/3 of the radius and ulna. This represents the most common site of radial fracture in the dog (1) and, in our survey, it accounted for 85% of the radial fractures. These fractures of the radius and ulna are most often associated with falling injuries; the typical case (Figure 1) is of a small breed dog jumping from the owner's arms. While open, comminuted, or both types of fracture are possible, they are uncommon and none were seen in our survey.

Management and prognosis of these fractures depends greatly on the size of the dog involved. Medium or large breeds, especially those that are less than 1 y old, carry an excellent prognosis with external coaptation or surgical management. If surgical management is deemed desirable, it should consist of bone plating or external fixator application. While techniques are described for the application of intramedullary pins in the distal part of the radius, they frequently do not provide sufficient stability to justify invasive surgery, and the risk of significant iatrogenic damage to the radiocarpal joint is unacceptably high (2).

Small or toy breeds are most commonly involved and they present a considerably more tenuous situation. The complication rate in these patients when these fractures are treated with external coaptation has been reported to be as high as 75%, apparently due to a significantly reduced intraosseous blood supply to the distal part of the radius in small breed dogs (1). Plate repair with 2.0-mm miniplates or the veterinary cuttable plate (Synthes, Mississaugua, Ontario) plus cancellous bone grafting is the treatment of choice in patients weighing 5 kg or less, and it can reduce complication rates to as low as 12.5% (1). External fixators can also be utilized successfully in these patients, although the complication rate is higher than with plate repair (2).

Animal Clinic of Regina, 1800 Garnet Street, Regina, Saskatchewan S4T 2Z2.

Figure 1. Distal radius and ulna fracture.

2. Tibial diaphyseal fractures

Sixteen percent (45/282) of our long bone fractures occurred in the tibial diaphysis and represented 61% (45/74) of all tibial fractures. Sixty-two percent of tibial diaphyseal fractures were simple transverse or oblique (Figure 2), while 38% were comminuted, which is in agreement with other surveys (3–5). The tibial diaphysis is a good site at which to utilize the principals of biologic fracture repair (6). In essence, the principles of biologic fracture repair are to preserve the vascular envelope by being minimally invasive or by not opening the fracture site at all. This approach forces the surgeon to ask, "Can I put all the pieces back together and rigidly fix them?" If the answer is yes, the disruption of blood supply required to expose and rigidly fix the fracture may be an acceptable trade-off to obtain longterm stability of the fracture, especially in a large dog. If the answer is no, opening the fracture produces the worst of all worlds; blood supply disruption, a less than fully stable fracture, and the potential introduction of bacterial contaminants. Stabilizing a tibial diaphyseal fracture without opening the fracture site may be as simple as applying external coaptation in a small dog or cat. In larger dogs, this often produces less than ideal stability, along with challenges in cast or bandage management. External fixators are the treatment of choice in comminuted tibial diaphyseal fractures. They are placed without opening the fracture site and adapt well to virtually all patients and fracture types.

Transverse fractures, especially in large patients, have the best prognosis after plate fixation. External

Figure 2. Tibial diaphyseal fracture.

Figure 3. Femoral diaphyseal fracture.

fixators, with or without intramedullary pins, can also be used successfully. Intramedullary pins and cerclage wires can provide effective stabilization to oblique tibial diaphyseal fractures, if the pin is placed in a normograde fashion (from the tibial plateau, across the fracture line, and into the distal fragment) and if the fracture line is sufficiently oblique to allow the placement of at least 2 full cerclage wires.

1. Femoral diaphyseal fractures

Twenty-eight percent (80/282) of our long bone fractures occurred in the femoral diaphysis. Sixty percent (48/80) of these fractures were simple transverse or oblique, or had only 1 reducible wedge fragment (Figure 3). Forty percent (32/80) were comminuted, which numbers closely parallel the largest published survey of femoral fractures in small animals (7). Somewhat surprisingly, the proportion of comminuted fractures in the femur is not significantly different from that in the tibia. One might expect the femur to be more resistant to comminuted fractures, since it is surrounded by a thick layer of muscle in comparison with the tibia, which has relatively little muscular covering.

The prognosis and surgical challenge associated with these cases is directly related to the degree of comminution and the size of the patient. Biologic fracture repair principles that apply so well to the tibia are more problematic in the femur because of the limitations in applying external skeletal fixators to this bone. Whereas connecting bars and fixator pins can be placed on all sides of the tibia, only the lateral aspect of the femur has unobstructed access. In addition, fixator pins placed in the femoral diaphysis must go through large muscle masses, which is associated with significant morbidity. These problems escalate as the size of the patient increases. Biologic techniques that involve specialized plates, or combinations of intramedullary pins with plates or external fixators, have been devised for use in the femur (8).

For the practitioner with pin and wire and external fixator capability, simple femoral fractures with significant obliquity can be well managed with an intramedullary pin and full cerclage wires. Transverse fractures, especially in young patients 10 kg and under, can be stabilized with an intramedullary pin and half external fixator (1 proximal and 1 distal fixator pin with a single connecting bar). Large patients, especially with more complex fractures, invariably require bone plating or other specialized techniques to maximize chances for success (7).

References

1. Welch JA, Boudrieau RJ, Dejardin LM, Spodnick GJ. The intraosseous blood supply of the canine radius: implications for healing of distal fractures in small dogs. Vet Surg 1997;26:57–61.
2. Muir P. Distal antebrachial fractures in toy-breed dogs. Compend Contin Educ Pract Vet 1997;19:137–145.
3. Piermattei DL, Flo GL. Handbook of Small Animal Orthopedics and Fracture Repair, 3rd ed. Philadelphia: WB Saunders, 1997:581.
4. Boone EG, Johnson AL, Montavon P, Hohn RB. Fractures of the tibial diaphysis in dogs and cats. J Amer Vet Med Assoc 1986;188:41–45.
5. Richardson EF. Tibial fractures in cats. Compend Contin Educ Vet Pract 1993;15:383–393.
6. Harasen G. Biologic repair of fractures. Can Vet J 2002;43:299–301.
7. Braden TD, Eicker SW, Abdinoor D, Prieur WD. Characteristics of 1000 femur fractures in the dog and cat. Vet Comp Orthop Traumatol 1995;8:203–209.
8. Harasen G. Fractures involving the distal extremity of the femur: Part 2 — The mature patient. Can Vet J 2002;43:131–132.